WADC TECHNICAL REPORT 52-292

ELEVATED- AND ROOM-TEMPERATURE PROPERTIES OF SELECTRON 44 AND 5105XP TRANSPARENT PLASTIC SHEET MATERIALS

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WRIGHT AIR DEVELOPMENT CENTER

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FOREWORD

This report was prepared by Battelle Memorial Institute under Air Force Contract Number AF 33(038)-10818, Research and Development Order Number 614-12, "Structural Plastics". The work was administered under the direction of the Materials Laboratory, Directorate of Research, Wright Air Development Center, with Mr. H. S. Schwartz acting as project engineer.

ABSTRACT

Two transparent plastic sheet materials, Selectron 44, a polyester, and 5105XP, an acrylate, were tested in tensile creep and creep rupture, crazing, short-time tensile, and deterioration at 80°, 160°, and 200°F. Additional short-time tensile tests were made at 250° and 300°F.

The creep and creep-rupture tests indicated that the 5105XP material had considerably more strength than Selectron 44 at all three test temperatures. The short-time tensile tests gave a similar indication at 80°, 160°, and 200°F, but at 250°F Selectron 44 appeared to have a slight superiority in strength. At 300°F, 5105XP had no practical load-carrying ability at all, while Selectron 44 showed a tensile strength of only 204 psi.

Selectron 44 displayed no crazing whatsoever at any temperature or strain rate. The crazing strength of 5105XP was, in general, equal to or greater than the rupture strength of Selectron 44 at all three test temperatures.

PUBLICATION REVIEW

This report has been reviewed and is approved.

FOR THE COMMANDING GENERAL:

M. E. SORTE
Colonel, USAF
Chief, Materials Laboratory
Directorate of Research

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

Tensile creep and creep-rupture, crazing, short-time tensile, and deterioration tests were made on two transparent plastic sheet materials (5105XP, an acrylate, and Selectron 44, a polyester) at room temperature, 160, and 200 F. Short-time tensile tests were also made at 250 and 300 F.

As shown in the tabulation below, the 5105XP material displayed a considerably greater rupture strength than Selectron 44 at all three test temperatures. The creep strength of 5105XP was likewise superior. The 10-, 100-, and 1000-hour rupture and crazing strengths of the two materials are shown in the following tabulation:

Material	Temperature, F	Stress, psi, to Produce Rupture or Crazing in 10 Hours	100 Hours	1000 Hours
		Rupture Strength		
Selectron 44	80	5830	5100	4400
5105XP	80	7550	6930	6300
Selectron 44	160	1920	1580	1340
5105XP	160	4000	3500	3140 est.
Selectron 44	200	800	670	540 est.
5105XP	200	2340	1960	1580
		Crazing Strength		
5105XP	80	5400	4650	4150
5105XP	160	2900 est.	2400	1850
5105XP	200	1300 est.	1170	1040

No crazing was observed to take place in Selectron 44 under any of the test conditions; therefore, no crazing data can be shown for this material. The stresses necessary to produce crazing in 5105XP at 80 F are only slightly less than those required for rupture in Selectron 44. At 160 and 200 F, the crazing strength of 5105XP is greater than the rupture strength of Selectron 44 by a considerable margin.

The tensile strength of 5105XP is superior to that of Selectron 44 at 80, 160, and 200 F, but inferior at 250 F. Material 5105XP has no practical load-carrying ability at 300 F, while that of Selectron 44 is only 204 psi.

The deterioration tests indicated that Selectron 44 was the more stable of the two materials at 160 and 200 F; however, the maximum loss in weight was only slightly in excess of one per cent in the 5105XP material.

Selectron 44 appeared to be quite notch-sensitive at room temperature.

Compared with some other transparent plastics, such as Lucite HC-201 and HC-202 and Plexiglas Ia and II, the 5105XP material displayed, in general, superior crazing and creep-rupture properties. The tensile strength was comparable at 80 and 160 F, but inferior to Lucite HC-202 and Plexiglas II at 200 F.

ELEVATED- AND ROOM-TEMPERATURE PROPERTIES OF SELECTRON 44 AND 5105XP TRANSPARENT PLASTIC SHEET MATERIALS

INTRODUCTION

This report covers work done under Contract Number AF 33(038)-10818 and is concerned with two transparent plastic materials, 5105XP, an acrylate, and Selectron 44, a polyester. Tensile-creep and creep-rupture, short-time tensile, and deterioration tests were made on these two materials at room temperature, 160, and 200 F. Short-time tensile tests were also conducted at 250 and 300 F, and some crazing tests were made on the 5105XP material at 80, 160, and 200 F.

The creep, creep-rupture, and crazing tests were made in standard Battelle creep frames and furnaces. Deformations were read optically by means of a microscope and platinum-strip type of extensometer. Because of the notch-sensitivity of Selectron 44 at room temperature, the normal manner of attaching the extensometers could not be used. It was necessary to devise other means that would not affect the creep and creep-rupture properties. The short-time tensile tests were conducted in a Baldwin-Southwark Universal Testing Machine with deformations recorded, whenever possible, on a Templin Stress-Strain Recorder.

Testing procedures for the short-time tensile, tensile-creep, and creep-rupture tests are described in the Appendix of a previous report(1).

SPECIFICATIONS, PREPARATION, AND HEAT TREATMENT OF TEST SPECIMENS

The two transparent materials, Selectron 44 and 5105XP, manufactured by the Pittsburgh Plate Glass Company and Rohm and Haas, respectively, were furnished by the Materials Laboratory, Wright Air Development Center. Three panels of 5105XP, 36 x 36 x 1/4 inches, and two panels of Selectron 44, 31-3/4 x 36 x 1/4 inches, were supplied for the evaluation program. No distinction was made as to the panel from which each of the various specimens was obtained. Thus, an average value of properties of the two or three panels was probably obtained.

Extreme care was taken in handling the materials during the machining operations. The protective paper covering was removed because it tended to cause the specimens to slip while being machined. A diagram of the tensile-creep, creep-rupture, and short-time tensile specimens is shown in a previous report(1). No lubricant was used during the machining operation, and care was taken that the specimens did not overheat.

The machined specimens were annealed to relieve internal stresses prior to testing. Selectron 44 was annealed at 125 C (257 F) and the 5105XP material at 155 C (311 F). Both materials were held at the annealing temperatures for 30 minutes and then allowed to cool to room temperature in about 1-1/2 to 2 hours. The specimens were suspended from one end while in the annealing furnace.

TENSILE-CREEP, CREEP-RUPTURE, AND CRAZING TESTS

A series of tensile-creep and creep-rupture tests was made on both Selectron 44 and 5105XP materials at 80, 160, and 200 F. The creep-rupture tests covered rupture times from about one to 1000 hours. Lower stress-creep tests were made to obtain creep-rate data and also low deformation points for the design curves.

Some crazing data were also obtained from the creep and creep-rupture tests, but at 160 and 200 F additional crazing tests were required. It was not possible to observe when crazing had started at these higher temperatures, since the specimens were enclosed in a furnace. The

additional crazing tests were made only on the 5105XP material, however, because no crazing was observed to take place on the Selectron 44 material at any test temperature.

The crazing tests were made at various stresses for a period of 75 hours. At the end of 75 hours, the specimens were removed from the furnace and observed for crazing. Based on the crazing characteristics of these 75-hour tests and on the creep and creep-rupture tests, generally of about 1000-hour duration, stresses were estimated at which crazing would start in 75 and 1000 hours. A line passing through these two points on a stress versus log of time plot produced the estimated crazing design curves (Figures 5 and 6).

All of the creep, creep-rupture, and crazing data obtained on Selectron 44 and 5105XP materials at 80, 160, and 200 F are shown in Tables 1 and 2. These data are reproduced as design curves in Figures 1 through 6 and as stress versus creep rate curves in Figure 7. In order to show a comparison of their strength characteristics at 80, 160, and 200 F, rupture and crazing curves for Selectron 44 and 5105XP are shown in Figures 8, 9, and 10.

These curves show that the 5105XP material has about 1000 to 2000 psi greater rupture strength than Selectron 44 at all three test temperatures. The creep strength of 5105XP is also greater than that of Selectron 44 by approximately the same amount.

No crazing was observed to take place in the Selectron 44 material at any stress or temperature. Crazing in the 5105XP material at 80 and 160 F seemed to occur at about 2 per cent deformation, increasing to perhaps 2-1/2 per cent at the lower strain rates. At 200 F, the crazing characteristics of 5105XP appear to be somewhat more sensitive to strain rate, with crazing starting at 2-3 per cent at the higher strain rates (higher stresses) and 3-4 per cent at the lower strain rates.

Since crazing strength of these transparent plastic materials is often considered a limiting factor from a design standpoint, it might be expected that Selectron 44, which shows no crazing whatsoever, would have a strength advantage over the 5105XP material. This is not necessarily so, however, since at 160 and 200 F, the crazing strength of 5105XP exceeds the rupture strength of Selectron 44 by a margin of 500 to 1000 psi. At room temperature only does the rupture strength of Selectron 44 slightly exceed the crazing strength of 5105XP.

It was observed during the testing of these two transparent plastic materials that Selectron 44 is quite notch sensitive at room temperature. Testing of this material was made more difficult because the extensometer strips could not be attached to the specimen in the normal manner. This

TABLE 1. CREEP AND CREEP-RUPTURE DATA FOR SELECTRON 44 AT ROOM TEMPERATURE, 160, AND 200 F

Specimen Number	Temperature, F	Stress, psi	Rupture Time, hours	Minimum Creep Rate, %/hour	Initial Deformation, %	Hours to Produce Total Deformation of: 0.5%	1.0%	2.0%	3.0%	5.0%	7.0%	10.0%	Start of Third Stage Creep: Time, hours	Deformation, %	Remarks
S44-C1	80	8000	On loading	(a)	–	–	–	–	–	–	–	–	–	–	(No crazing was observed to take
S44-C2	80	8000	On loading	(a)	–	–	–	–	–	–	–	–	–	–	place on any of the specimens
S44-C3	80	7000	0.5	(a)	–	–	–	–	–	–	–	–	–	–	tested in creep, or creep-rupture
S44-C4	80	6500	2.0	(a)	–	–	–	–	–	–	–	–	–	–	at room temperature, 160, or
S44-C5	80	6000	3.4	(a)	–	–	–	–	–	–	–	–	–	–	200F)
S44-C30	80	5500	25.8	(c)	1.48	–	–	1.0	11.4	–	–	–	–	–	Failed outside gaged section
S44-C6	80	5000	194.9(b)	(a)	–	–	–	–	–	–	–	–	–	–	–
S44-C7	80	5000	4.7	(c)	1.4	–	–	1.5	–	–	–	–	–	–	–
S44-C8	80	5000	22 1	(c)	1.2	–	–	3.0	–	–	–	–	–	–	–
S44-C25	80	5000	59.5	0.014	1.1	–	–	10.0	–	–	–	–	–	–	–
S44-C29	80	5000	129.2	0.010	1.38	–	–	1.5	19.0	–	–	–	–	–	Failed in gripped section
S44-C28	80	4750	146.3	0.0075	1.20	–	–	6.5	65.0	–	–	–	–	–	Failed outside gaged section
S44-C32	80	4750	169.6	0.0070	1.25	–	–	6.0	57.0	–	–	–	–	–	–
S44-C34	80	4500	752.5	0.0024	1.20	–	–	11.0	64.0	688.0	–	–	–	–	–
S44-C26	80	4000	1001.9(b)	0.00066	0.82	–	4.0	160.0	–	–	–	–	–	–	–
S44-C13	160	3000	On loading	(c)	–	–	–	–	–	–	–	–	–	–	–
S44-C16	160	2500	2 minutes	(c)	–	–	–	–	–	–	–	–	–	–	–
S44-C17	160	2500	1.1	(a)	–	–	–	–	–	–	–	–	–	–	–
S44-C18	160	2000	6.9	(c)	3.55	–	–	–	–	0.03	0.6	–	–	–	–
S44-C19	160	2000	3.7	(c)	2.70	–	–	–	0.2	3.0	–	–	–	–	–
S44-C24	160	1750	5.9	(c)	2.41	–	–	–	0.3	–	–	–	–	–	–
S44-C27	160	1750	29.8	0.057	1.10	–	–	0.4	2.0	14.0	28.0 est.	–	–	–	–
S44-C20	160	1500	169.9	0.014	0.10	–	0.3	2.0	6.0	16.0	53.0	–	–	–	–
S44-C21	160	1250	1083.0(b)	0.00072	0.73	–	1.5	3.0	170.0	–	–	–	–	–	–
S44-C11	200	1000	0.3	(c)	2.30	–	–	–	0.1	–	–	–	–	–	–
S44-C23	200	800	30.6	0.038	3.7	–	–	–	–	0.3	1.4	14.0	–	–	–
S44-C22	200	650	91.6	0.0080	1.0	–	–	0.5	1.0	3.0	45.0	–	–	–	–
S44-C14	200	500	686.2	0.00053	0.8	–	0.1	2.5	5.0	407.0	–	–	–	–	–

(a) No extensometer was used.

(b) Discontinued.

(c) Failed in too short a time to establish a creep rate.

TABLE 2. CREEP, CREEP-RUPTURE, AND CRAZING DATA FOR 5105 XP AT ROOM TEMPERATURE, 160, AND 200 F

Specimen Number	Temperature, F	Stress, psi	Rupture Time, hours	Minimum Creep Rate, %/hour	Initial Deformation, %	Hours to Produce Total Deformation of: 0.5%	1.0%	2.0%	3.0%	5.0%	7.0%	10.0%	Start of Third Stage Creep: Time, hours	Deformation, %	Remarks
XP-C1	80	8000	2.0	(a)	–	–	–	–	–	–	–	–	–	–	Started to craze at 0.2 hour
XP-C16	80	7500	16.9	0.195	2.0	–	–	0	0.4	–	–	–	–	–	Started to craze at 0.1 hour
XP-C2	80	7000	81.7	(a)	–	–	–	–	–	–	–	–	–	–	Started to craze at 1.0 hour
XP-C3	80	6000	24.2(b)	(a)	–	–	–	–	–	–	–	–	–	–	Started to craze at 2.0 hours
XP-C4	80	6000	1015.0(b)	0.0013	1.4	–	–	4.0	15.0	800.0	–	–	–	–	Started to craze at 2.0 hours
XP-C11	80	5000	1007.5(b)	0.00035	1.2	–	–	25.0	–	–	–	–	–	–	Started to craze at 20.0 hours
XP-C18	80	4000	1005.1(b)	0.0002	1.2	–	–	230.0	–	–	–	–	–	–	No crazing observed
XP-C5	160	5000	On loading	(c)	–	–	–	–	–	–	–	–	–	–	No crazing observed
XP-C17	160	4500	1.2	(c)	1.44	–	–	–	0.1	0.3	–	–	0.2	3.8	Heavily crazed
XP-C7	160	4000	5.8	1.10	1.55	–	–	0.1	0.6	1.9	3.6	4.6 est.	3.5	6.8	Heavily crazed
XP-C14	160	3500	150.0	0.069	1.40	–	–	1.0	6.0	17.5	33.0	78.0	94.0	11.0	Heavily crazed
XP-C10	160	3000	1012.6(b)	0.00105	1.05	–	–	5.0	38.0	1058 est.	–	–	–	–	Heavily crazed
XP-C29	160	2600	92.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	Medium crazed
XP-C12	160	2500	985.3(b)	0.00051	1.30	–	–	12.0	628.0	–	–	–	–	–	Lightly crazed
XP-C30	160	2500	75.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	Medium crazed
XP-C34	160	2500	75.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	Lightly crazed
XP-C35	160	2400	75.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	No crazing observed
XP-C22	160	2000	1031.2(b)	0.00016	0.65	–	18.0	–	–	–	–	–	–	–	Lightly crazed
XP-C20	160	1500	1177.0(b)	0.00009	0.31	2.5	475.0	–	–	–	–	–	–	–	No crazing observed
XP-C6	200	3000	0.2	(c)	–	–	–	–	–	–	–	–	–	–	Heavily crazed
XP-C8	200	2500	2.0	(c)	1.0	–	–	0.5	0.9	–	–	–	–	–	Heavily crazed
XP-C15	200	2000	79.6	0.08	1.0	–	–	2.6	14.4	26.8 est.	–	–	19.0	3.35	Heavily crazed
XP-C23	200	1750	75.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	Heavily crazed
XP-C9	200	1500	1034.5(b)	0.00138	0.65	–	5 5.0	20.0	140.0	760.0	–	–	–	–	Medium crazed
XP-C26	200	1500	73.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	Heavily crazed
XP-C27	200	1300	75.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	Lightly crazed
XP-C21	200	1250	1059.9(b)	0.00057	1.25	–	–	17.0	118.0	–	–	–	–	–	Lightly crazed
XP-C33	200	1200	75.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	Very lightly crazed
XP-C 36	200	1100	75.0(b)	(a)	–	–	–	–	–	–	–	–	–	–	No crazing
XP-C13	200	1000	959.3(b)	0.00128	0.50	–	5.0	75.0	425.0	–	–	–	–	–	No crazing

(a) No extensometer was used. (b) Discontinued. (c) Failed in too short a time to establish a creep rate.

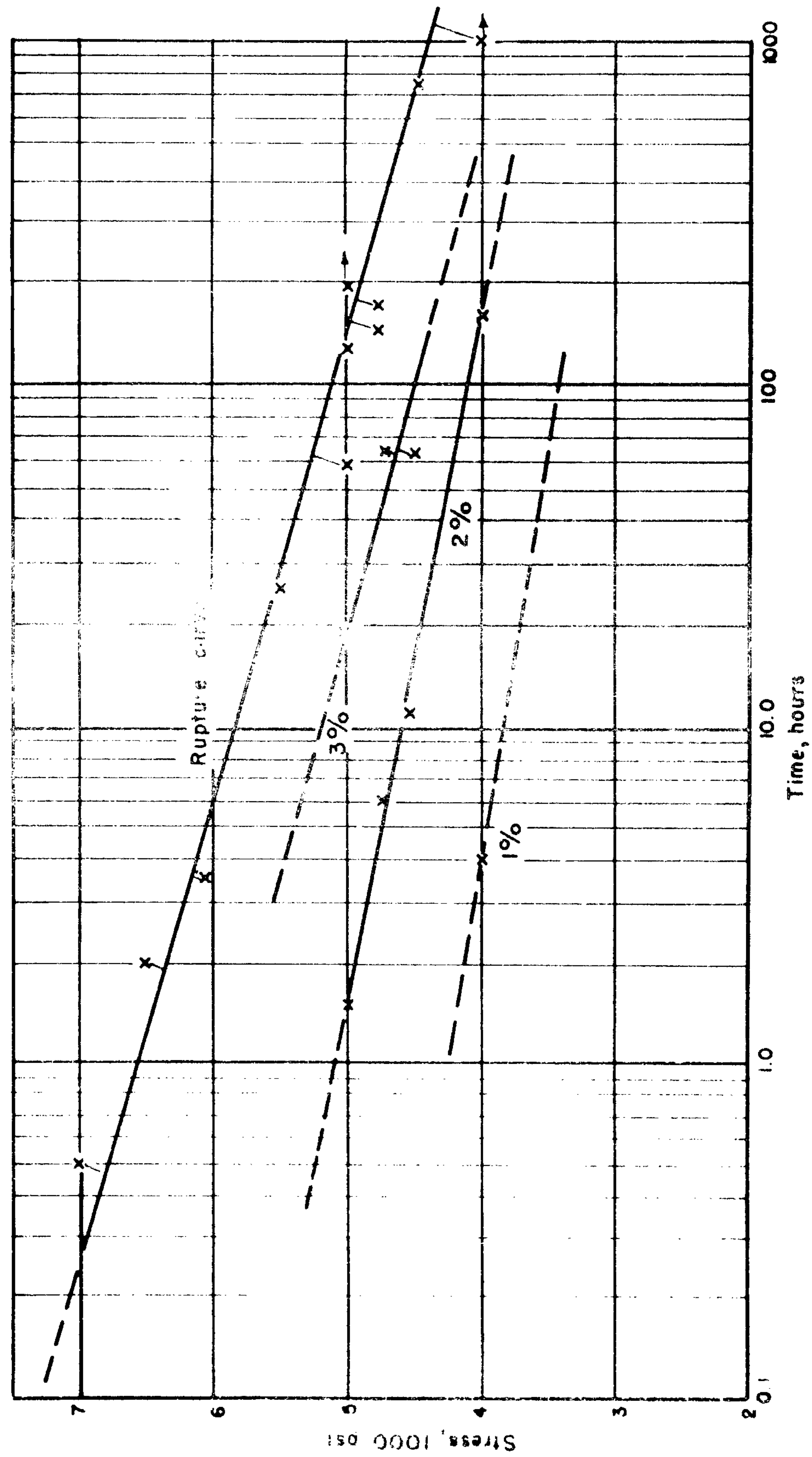

FIGURE I. DESIGN CURVES FOR SELECTRON 44 AT 80 F

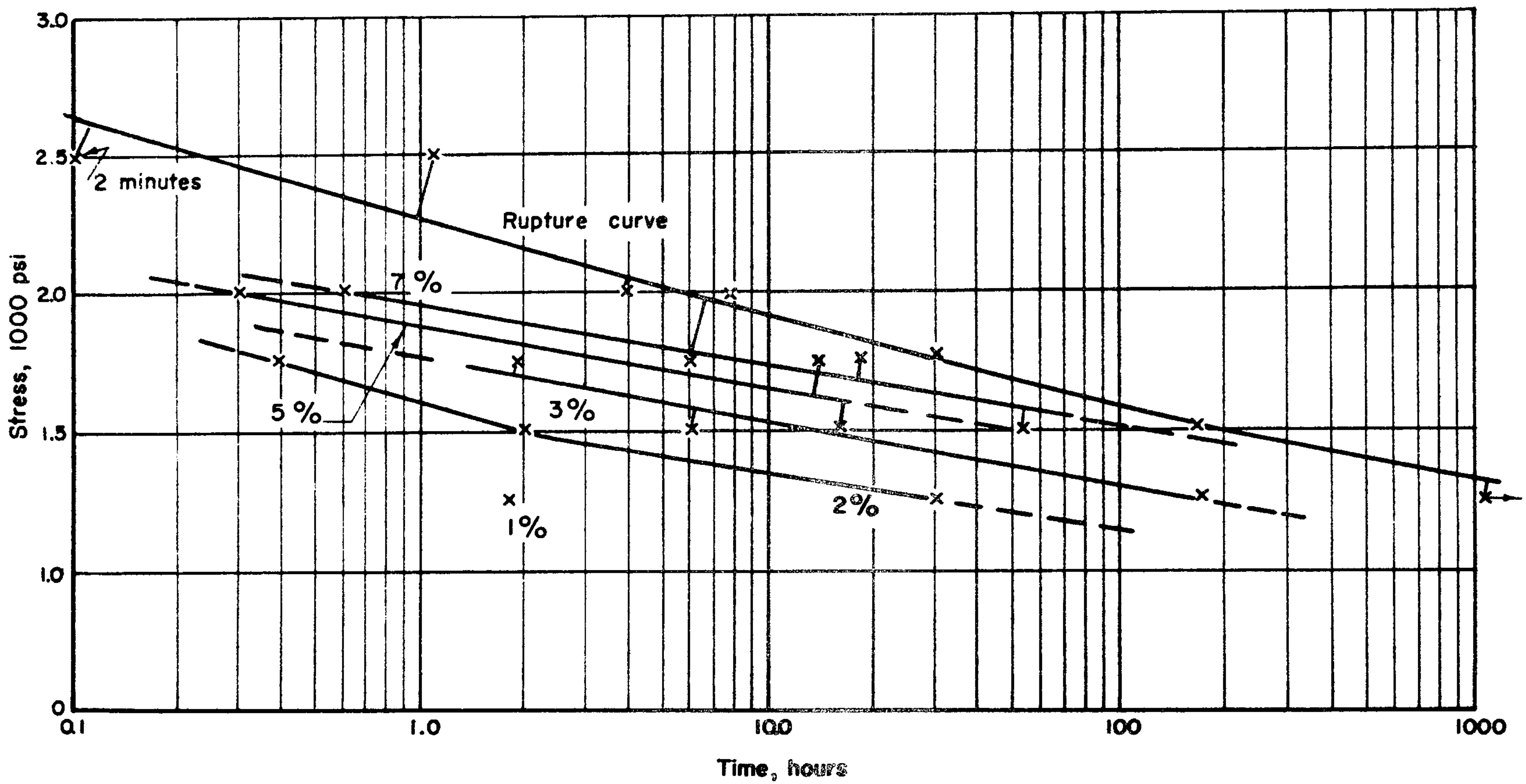

FIGURE 2. DESIGN CURVES FOR SELECTRON 44 AT 160 F

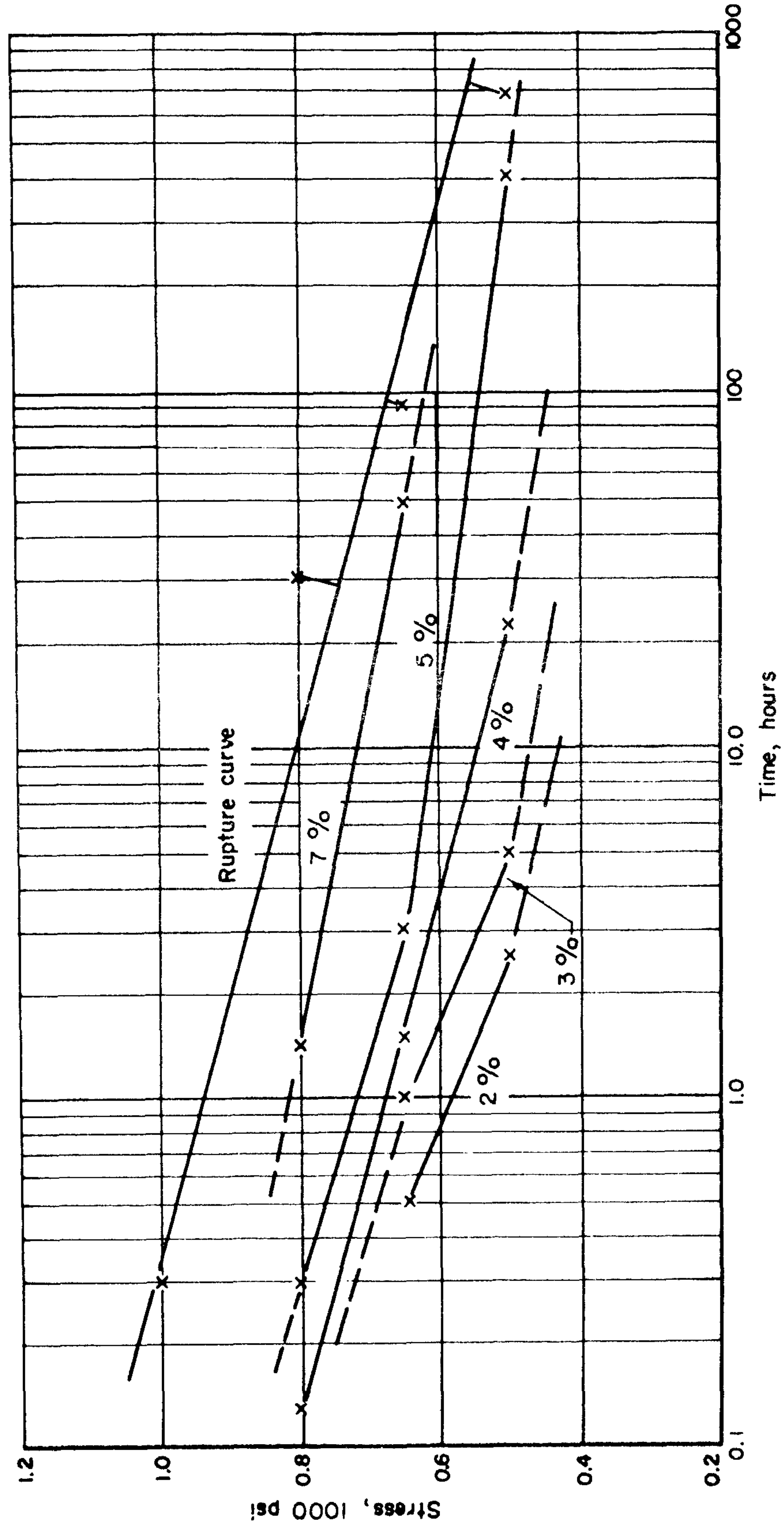

FIGURE 3. DESIGN CURVES FOR SELECTRON 44 AT 200 F

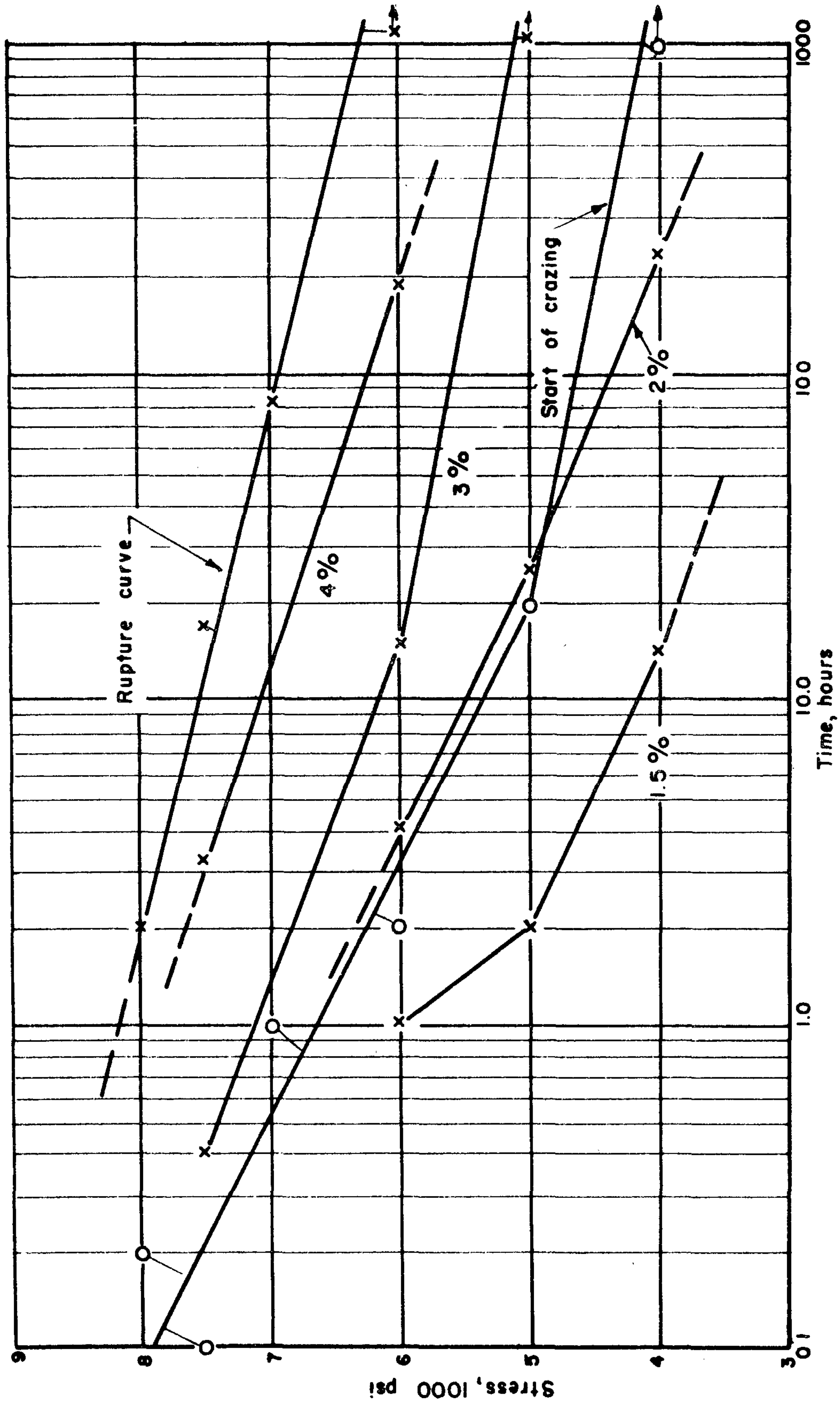

FIGURE 4. DESIGN CURVES FOR 5105XP AT 80 F

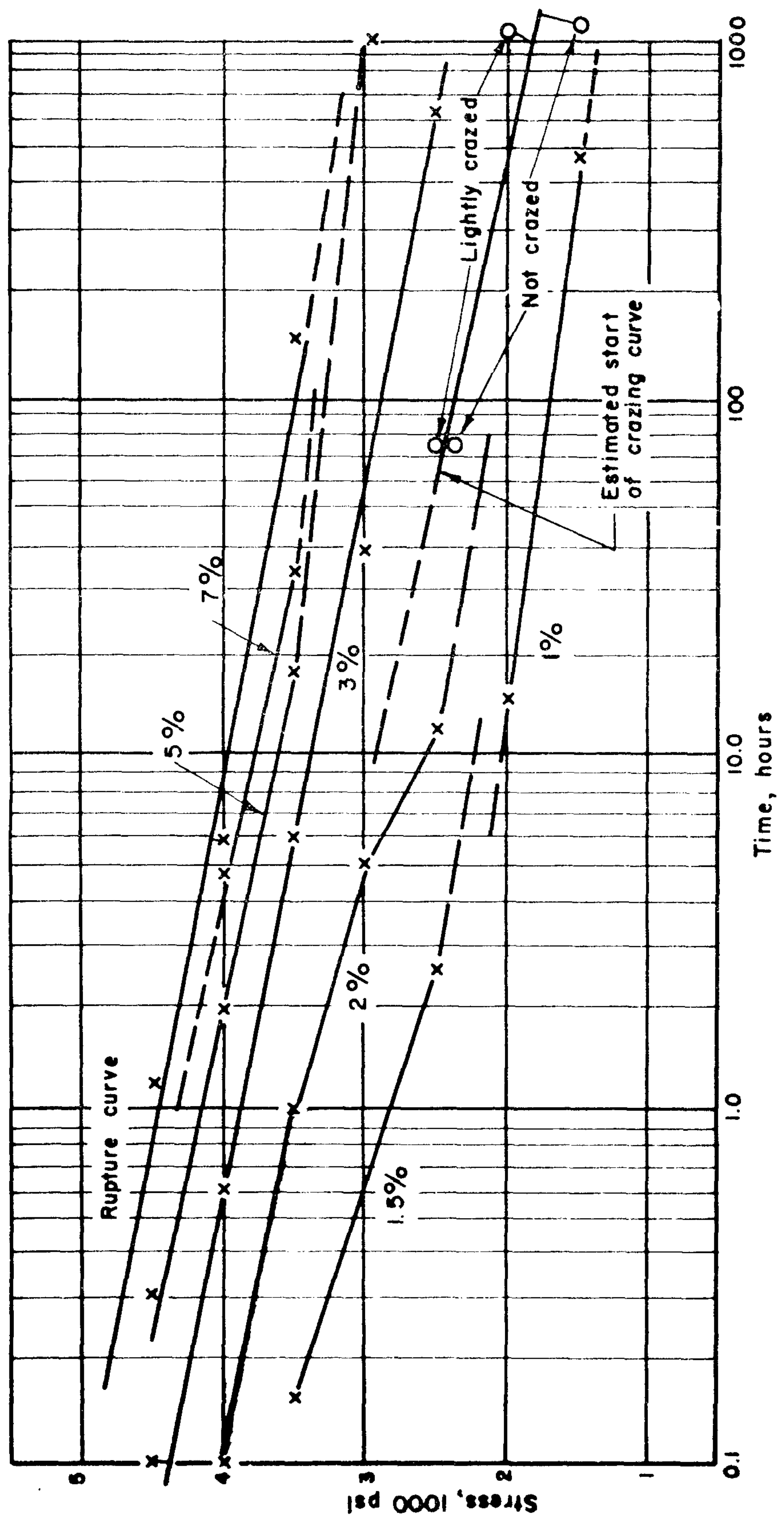

FIGURE 5. DESIGN CURVES FOR 5105 XP AT 160 F

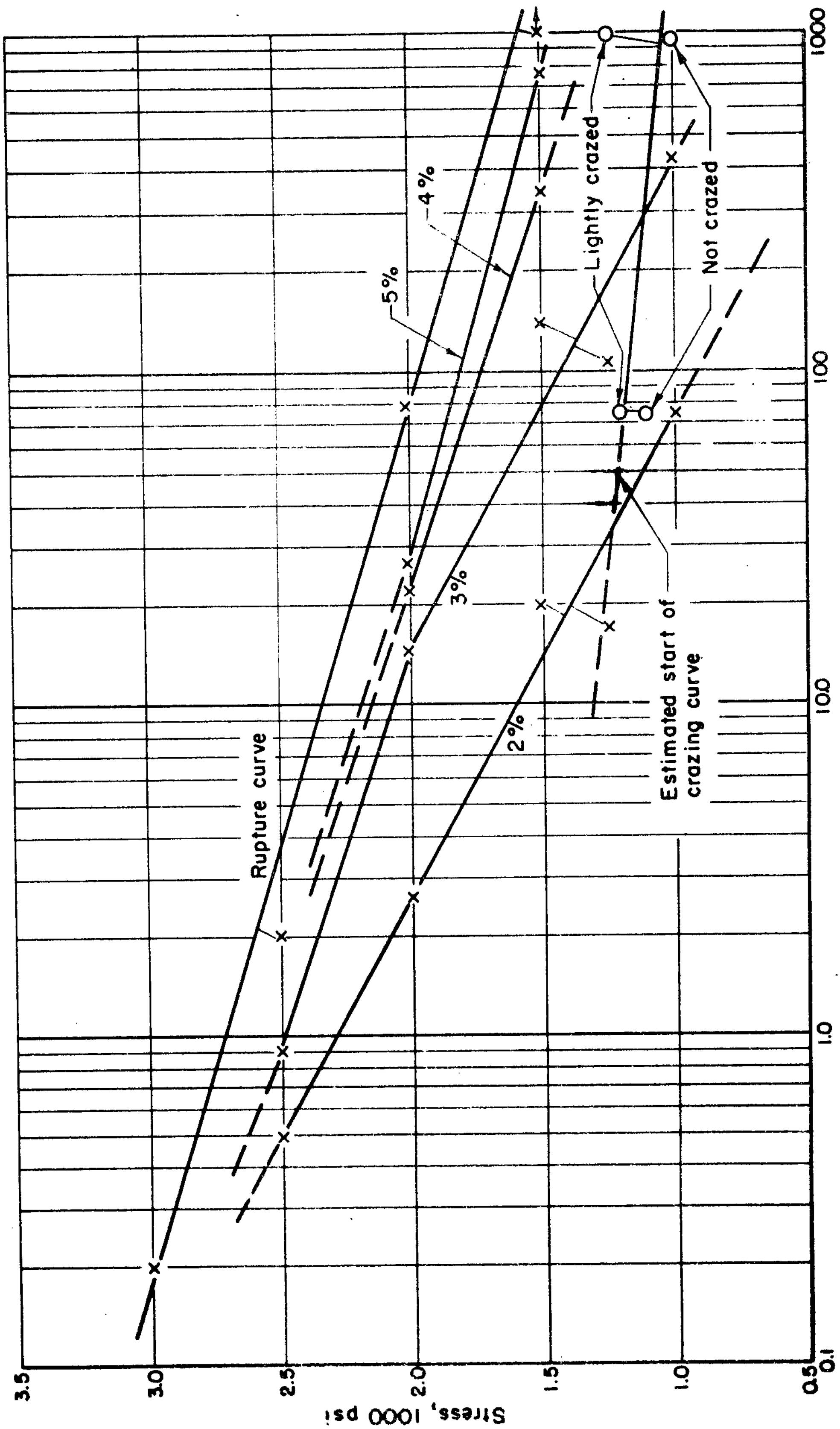

FIGURE 6. DESIGN CURVES FOR 5105 XP AT 200 F

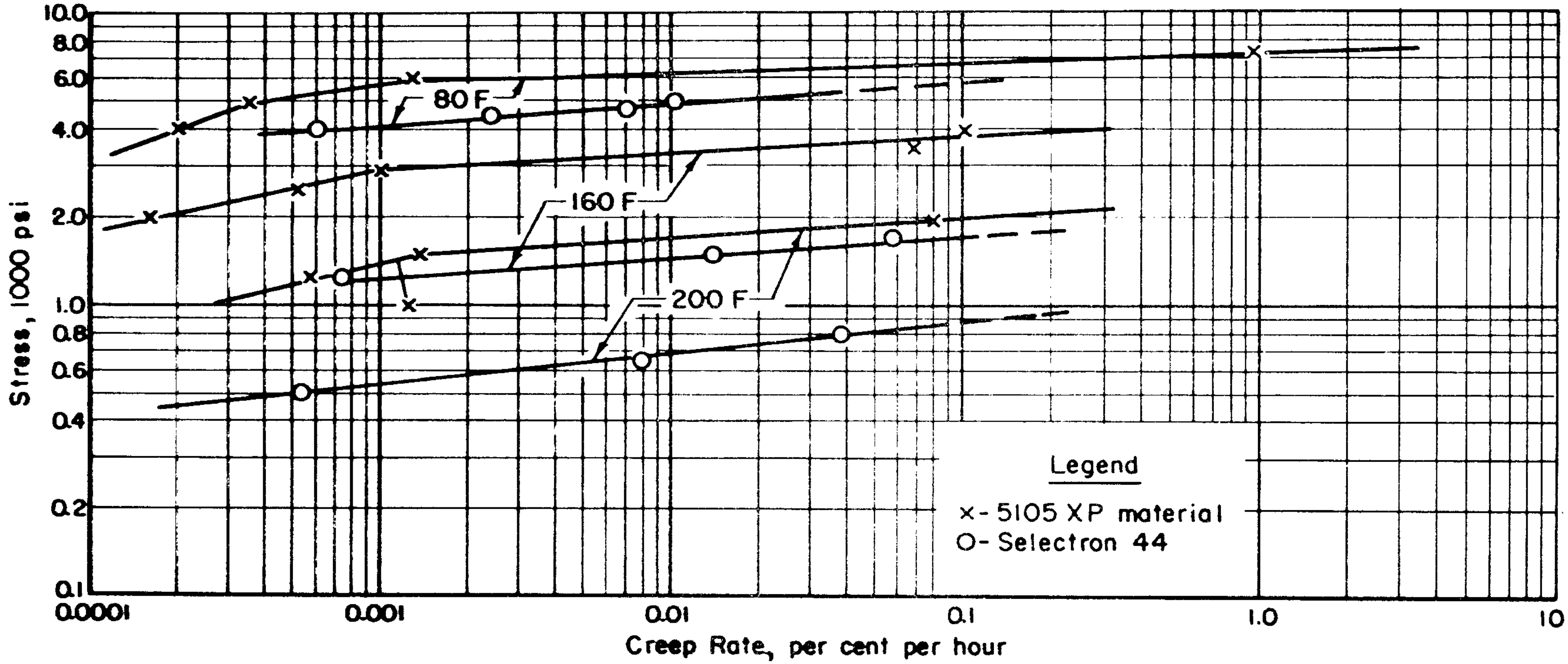

FIGURE 7. STRESS VERSUS CREEP-RATE CURVES FOR SELECTRON 44 AND 5105 XP MATERIALS AT 80, 160, AND 200 F

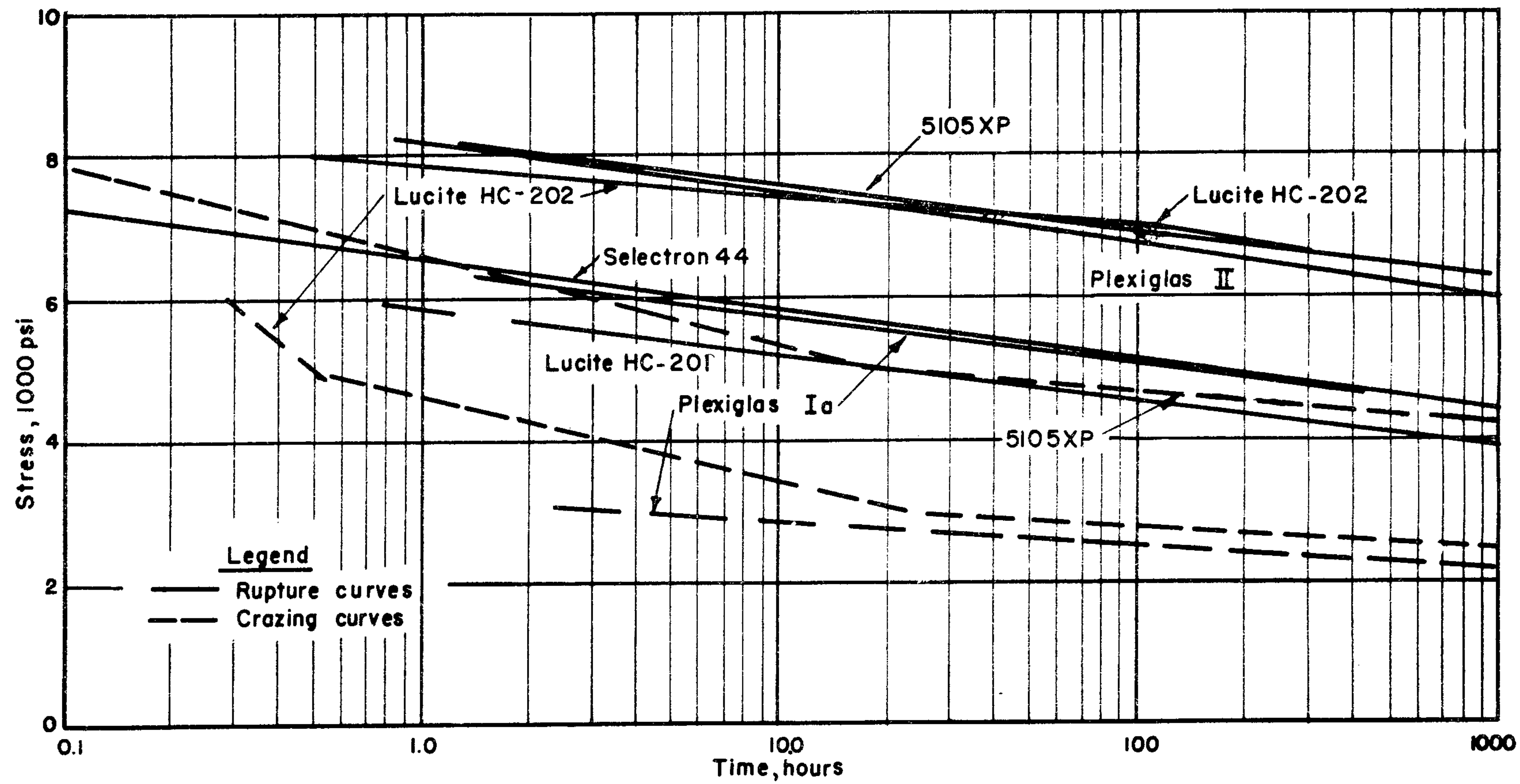

FIGURE 8. RUPTURE AND CRAZING CURVES FOR SEVERAL TRANSPARENT PLASTIC MATERIALS AT ROOM TEMPERATURE (80F)

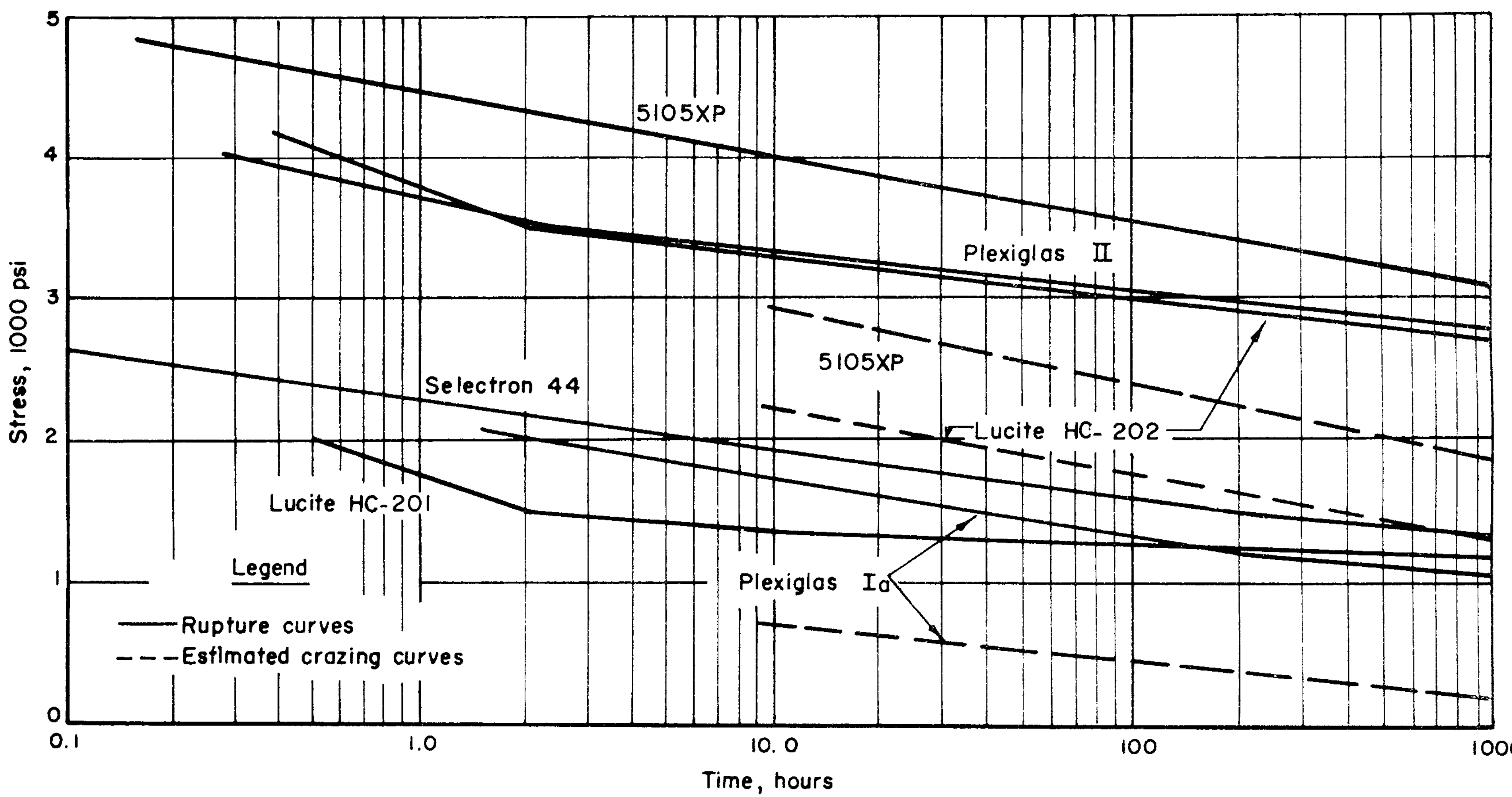

FIGURE 9. RUPTURE AND CRAZING CURVES FOR SEVERAL TRANSPARENT PLASTIC MATERIALS AT 160 F

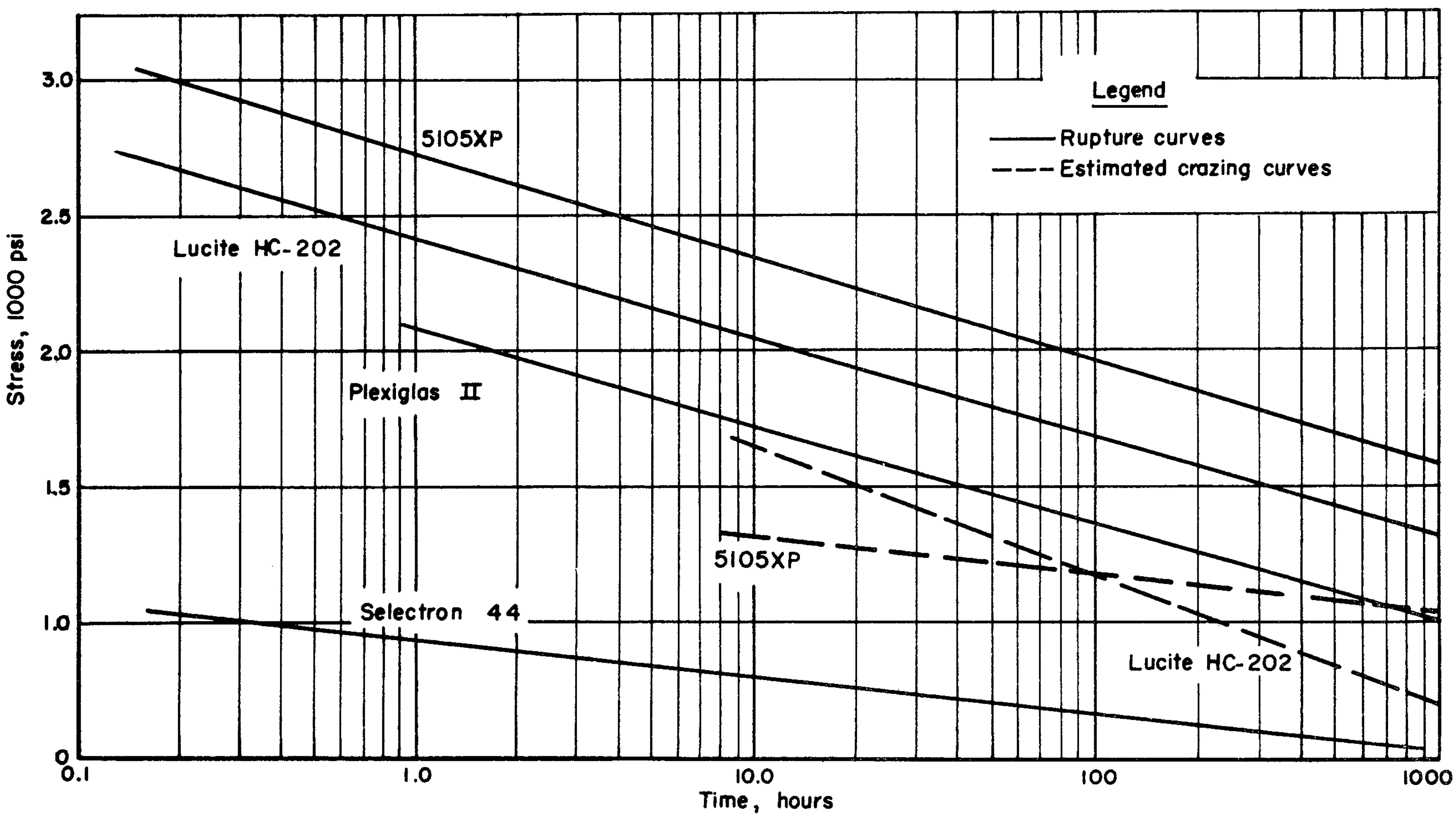

FIGURE 10. RUPTURE AND CRAZING CURVES FOR SEVERAL TRANSPARENT PLASTIC MATERIALS AT 200 F

notch sensitivity of Selectron 44 may necessitate its handling, during fabrication and installation, with extreme care.

Also shown in Figures 8, 9, and 10 are the rupture and crazing curves representing data obtained previously on some other transparent plastic materials[1], Lucite HC-201 and HC-202 and Plexiglas Ia and II. These additional data are presented here for purposes of showing a comparison of the strength characteristics of the various transparent materials at room temperature, 160, and 200 F.

An inspection of Figure 8 will show the rupture curves of 5105XP, Lucite HC-202, and Plexiglas II grouped together near the top of the plot. This indicates that the strengths of these three materials at room temperature are about the same and are also the highest of all the materials shown. The rupture strengths of the other three materials, Plexiglas Ia, Lucite HC-201 and Selectron 44, are also about the same, but approximately 2000 psi lower in strength than the first group.

The 5105XP material displays a superior crazing strength by a considerable margin when compared with the other materials at room temperature. Furthermore, the stresses required to produce start of crazing in the 5105XP material are very nearly the same as the stresses required to cause failure in Lucite HC-201, Plexiglas Ia, and in Selectron 44.

At 160 F, the 5105XP material has the highest strength of all six materials shown in Figure 9, with Plexiglas II and Lucite HC-202 being about 500 psi lower in rupture strength. The 5105XP material also displays a superior crazing strength when compared with Lucite HC-202 and Plexiglas Ia. No crazing data are available for the other materials.

At 200 F, the 5105XP material again displays the highest strength of all the materials tested (Figure 10), with Lucite HC-202 and Plexiglas II appearing somewhat weaker. Crazing data are shown only for Lucite HC-202 and 5105XP. Lucite HC-202 appears to have the higher crazing strength at the higher strain rates, while the 5105XP material appears to require higher stresses for start of crazing at the lower strain rates.

SHORT-TIME TENSILE PROPERTIES

Short-time tensile tests were made on both 5105XP and Selectron 44 at 80, 160, 200, 250, and 300 F. Results of these tests are shown in Table 3 and Figure 11. The testing procedure as discussed in the Appendix of a previous report[1] was generally followed. The only departure from

TABLE 3. SHORT-TIME TENSILE DATA FOR SELECTRON 44 AND 5105XP AT ROOM TEMPERATURE, 160, AND 200 F

Material	Specimen Number	Temperature, F	Area, sq in.	Tensile Strength, psi	Average Tensile Strength, psi	Yield Strength, psi 0.1% Offset	Yield Strength, psi 0.2% Offset	Elastic Modulus, psi	Proportional Limit, psi	Remarks
Selectron 44	S44-T13	80	0.12452	9,910	–	(a)	–	–	–	No crazing
	S44-T14	80	0.12223	9,500	9,705	(a)	–	–	–	Ditto
	S44-T5	160	0.12425	2,655	–	(a)	–	–	–	"
	S44-T6	160	0.12350	3,230	2,942	(a)	–	–	–	"
	S44-T7	200	0.12225	1,638	–	(a)	–	–	–	"
	S44-T8	200	0.12450	1,805	1,712	(a)	–	–	–	"
	S44-T9	250	0.12221	368	–	(a)	–	–	–	"
	S44-T10	250	0.12365	607	482	(a)	–	–	–	"
	S44-T12	300	0.12350	204	204	(a)	–	–	–	"
5105XP	XP-T1	80	0.12594	9,890	–	3,770	4,850	516,000	1,350	Lightly crazed
	XP-T3	80	0.12026	9,880	–	(a)	–	–	–	Lightly crazed
	XP-T10	80	0.12624	10,840	–	3,280	4,083	318,000	1,900	Lightly crazed
	XP-T11	80	0.12474	11,030	10,410	(a)	–	–	–	Lightly crazed
	XP-T9	160	0.12350	5,550	–	(a)	–	–	–	Heavily crazed
	XP-T5	160	0.12550	5,860	5,705	2,750	3,580	319,000	680	Heavily crazed
	XP-T8	200	0.12445	2,090	2,090	(a)	–	–	–	Medium crazed
	XP-T7	250	0.12315	206(b)	206	(a)	–	–	–	Lightly crazed
	XP-T6	300	0.12500	(c)	–	(a)	–	–	–	–

(a) No extensometer was used.

(b) Tensile machine reached limit of travel.

(c) Too low to obtain value.

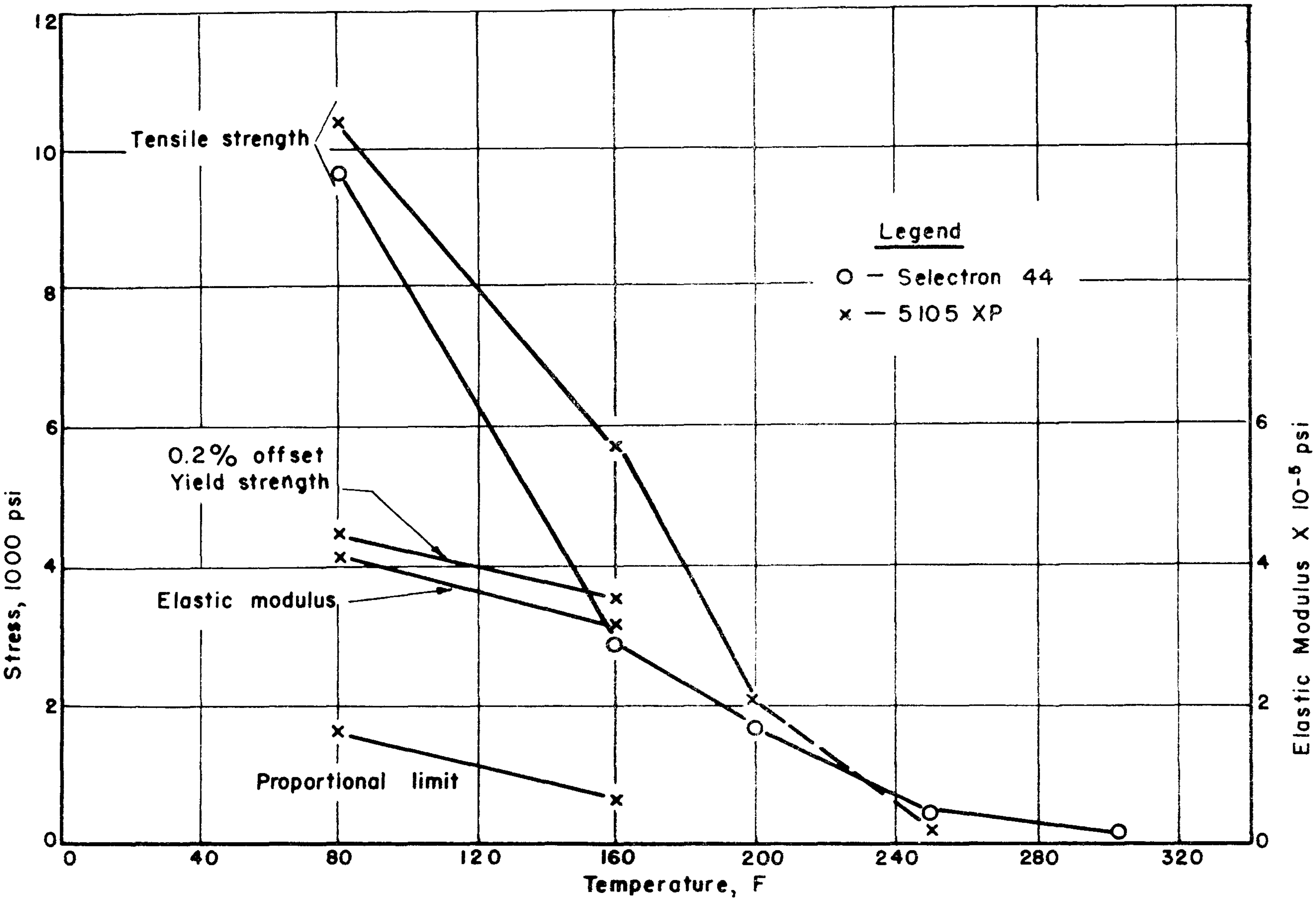

FIGURE II. SHORT-TIME TENSILE PROPERTIES OF SELECTRON 44 AND 5105XP AT ROOM TEMPERATURE 160, 200, 250 AND 300 F

the described procedure was in the method of strain measurement. Rather than using the microformer extensometer, a Templin Autographic Stress-Strain Recorder was employed whenever measurements were made.

Because of the notch-sensitivity of Selectron 44 at room temperature, no extensometer was attached to the specimens of this material during testing; therefore, yield strength, modulus of elasticity, and proportional limit values were not obtainable. At elevated temperatures, both Selectron 44 and 5105XP materials soften too excessively to allow attachment of an extensometer to the specimens.

The tensile strength of the 5105XP material ranged from about 10,400 psi at room temperature to 206 psi at 250 F. No reliable figure could be obtained at 300 F because of the extremely low strength at this temperature. The tensile strength of Selectron 44 is somewhat lower than that of 5105XP at 80, 160, and 200 F, but slightly higher at 250 F. The tensile strength of this material ranged from 9700 psi at room temperature to 204 psi at 300 F. The tensile strength of 5105XP compares favorably with the transparent acrylate, Lucite HC-202, at 80 and 160 F, but at 200 F it appears to be somewhat weaker.

The room-temperature yield strength (0.2 per cent offset) of 5105XP averages about 4460 psi, which is somewhat low when compared with Lucite HC-202 and Plexiglas II which showed values of 5845 and 5460 psi, respectively. The room-temperature elastic modulus of 4.17×10^5 psi, and the proportional limit of 1625 psi for 5105XP material are comparable to those of Plexiglas II.

DETERIORATION PROPERTIES

A series of deterioration tests was made on the two transparent plastic materials, 5105XP and Selectron 44, at 160 and 200 F. The purpose of these tests was to determine the stability of these two materials by exposing them for 24, 200, and 1000 hours at 160 and 200 F. After each period of time, the samples, one inch square by 1/4 inch thick, were weighed and the differences in weight noted. These tests were made in duplicate. The results in per cent weight loss for each exposure are shown in Table 4. All percentages are based on the original weight of the sample.

Of the two materials, 5105XP consistently displays the greater weight loss, although the difference between the two materials is small. The maximum reduction in weight is only slightly in excess of one per cent which is probably negligible from a design standpoint. It is pointed out that

the 5105XP material shows the same loss in weight after the 1000-hour exposure as it does after 200 hours when heated at 200 F.

TABLE 4. DETERIORATION DATA ON SELECTRON 44 AND 5105XP AT 160 AND 200 F

Specimen Number*	Temperature, F	Per Cent Weight Loss, After Exposure of 24 Hours	200 Hours	1000 Hours
SEL-A	160	0.29	0.58	0.64
SEL-B	160	0.26	0.59	0.63
XP-A	160	0.33	0.74	0.89
XP-B	160	0.32	0.80	0.92
SEL-C	200	0.54	0.89	1.02
SEL-D	200	0.57	0.80	0.98
XP-C	200	0.67	1.07	1.07
XP-D	200	0.61	1.29	1.29

*SEL designates Selectron 44
XP designates 5105XP

When compared with four other transparent plastic materials, Plexiglas Ia and II and Lucite HC-201 and HC-202, Selectron 44 and 5105XP display the greatest loss in weight after each exposure. In some cases, the loss is more than twice as great for comparable conditions of exposure.

REFERENCE

1. WADC Technical Report 52-38 of February, 1952, entitled "Elevated- and Room-Temperature Properties of Transparent Acrylic Sheet Materials".